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STENSON'S PATENT STEAM BOILERS.

Fig. 4.

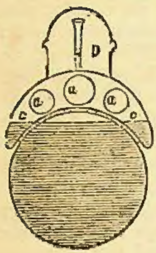


Fig. 5.

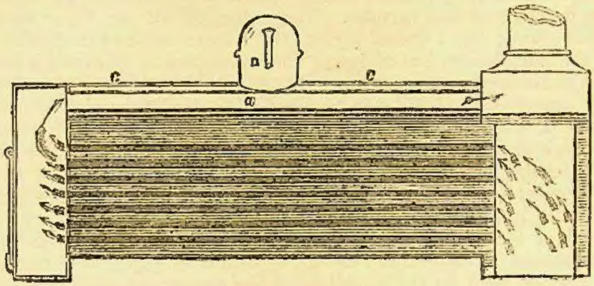


Fig. 6.

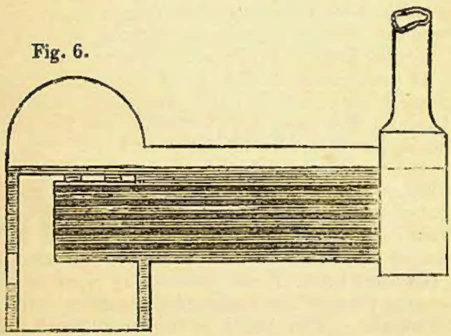


Fig. 7.

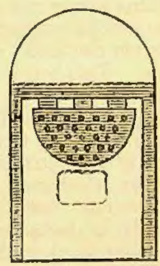


Fig. 8.

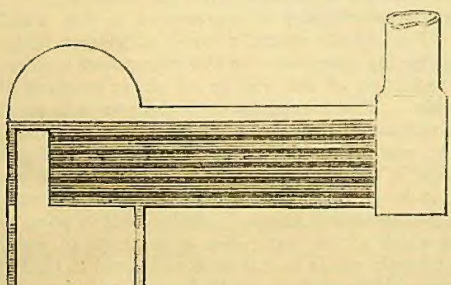


Fig. 9.

STENSON'S PATENT STEAM BOILERS.

(Patent dated December 27, 1851. Specification enrolled June 27, 1852. See *ante*, p. 35.)

Specification.

My invention relates to certain apparatus for the generation of steam, as hereinafter described. An auxiliary or furnace boiler may be constructed in the interior of any reverberatory furnace, connected with the boiler attached to the engine by which the motive machinery of ironworks is usually worked. My method of constructing and using such auxiliary boiler is as follows:—I construct in the interior of a reverberatory furnace a boiler of the same form in its interior as the inside of the fireplace of such furnace. The outer case of the boiler may be of any convenient shape; but I should prefer it of a form somewhat similar to the interior case of the same boiler, but of larger dimensions, so as to leave a water-space on all sides and at the top, except on that side towards the bridge or throat of the furnace, on which side there must be an opening corresponding to the aperture along which the flame is made to pass over the bridge of the furnace. There must also be openings through the side of such boiler corresponding to the holes now in use for the supply of fuel and for the heating of staffs. All the openings before mentioned to be made watertight according to the ordinary methods. The fire surface of this auxiliary boiler is lined with fire-brick, so as to prevent the auxiliary boiler absorbing too much of the heat necessary for well working the iron, either in puddling or other operations. I connect this boiler by means of pipes with such large steam boilers as may be used for the impelling of the motive machinery employed in the works. One of these pipes is connected from the top of the auxiliary or furnace boiler just described with the upper part (but below the water-line) of such large steam boiler, and the other pipe is connected from the bottom, or near the bottom, of such furnace boiler with the lower part of the said large steam boiler. The top pipe is fixed so that it may rise a little between its connection on the top of the furnace boiler towards its junction with the large one, thus completing the circulation of the water therein contained. The top pipe I call the flow-pipe, and the bottom one the return-pipe. This boiler is shown in plan in fig. 1, and in elevation in fig. 2. Another auxiliary boiler or steam generator may also be placed in the neck or outlet duct of the puddling or other furnace; which auxiliary boiler or steam generator I make of a form suitable to the neck or throat of such furnace, but leaving an opening on one side of such auxiliary boiler or steam generator, for the purpose of getting off the cinder which runs from the bottom of the furnace—this opening to be secured in the manner before stated. This auxiliary boiler I also connect by pipes in a way similar to that adopted in the connecting-pipes of the furnace boiler before described as being fixed in the fireplace of furnaces. This boiler is shown at fig. 3. The object of both these auxiliary boilers is to gain a greater supply of steam by the same expenditure of fuel as is required for the proper heating of the reverberatory furnace with which such auxiliary boilers are connected in manner before mentioned.

Another construction of steam generator or boiler is represented in figs. 4 and 5, applicable for various purposes. The objects specially aimed at in this boiler are; first, a much larger flue surface, for the more equable and economical application of the heat; and secondly, the reduction of the friction of air or products of combustion passing through the tubes. The arrangement I propose admits of enlarging the blast-pipe, reduces the velocity of draught, and, by means of return-tubes through an extra steam chamber, ensures the drying of the steam. In fig. 4 are represented three tubes marked *a*, *a*, *a*, the aggregate area of which should not be less than that of the chimney. C is the steam chamber, which should be strong, and will supply a long-acknowledged desideratum; namely, a boiler oval in point of form, without any diminution in the width of the water-line or the depth of water above the tubes, while the increase of weight would be but little additional to that of the boilers now in use. A steam dome would be desirable at D, from some point near the top of which the steam pipe should receive its supply for the cylinders. Holes perforated through the upper surface of the boiler would carry off the steam as generated by the tubes, and give facility to a free circulation of the water generally.

Fig. 1.

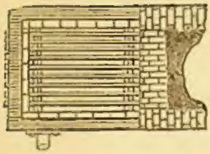


Fig. 2.

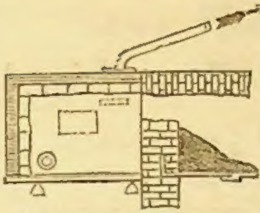
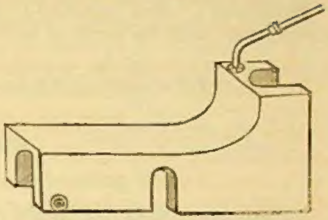


Fig. 3.



Another arrangement for increasing the generation of steam is shown in longitudinal section, fig. 6, and in transverse section, fig. 7, and a modification of the same in longitudinal section, fig. 8, and transverse section, fig. 9, in which the tubes are made to project, as shown, into the body of the fire-box, and a great increase of heating surface thereby obtained, thus securing an additional length in the tubes without adding to the length of the boiler.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—When my solution of the *Exciseman's Staff Question* was first communicated by my friend Mr. Wilkinson, for insertion in your widely-circulated Journal, I had no idea that it would ever have attracted so much attention. I am glad, however, that it has been the means of eliciting the elegant and general investigation of "Workman" contained in No. 1514. Since the final result of "Workman," for the particular case of the cylinder does not agree with mine a page 345, No. 1499, I have been induced to reconsider my own investigation The equation

$$(1)+(2) = \frac{l}{2}\cos.\beta\,.\,W,$$

should be

$$(1)+(2) = \left(\frac{l}{2}\cos.\beta + a\sin.\beta\right)W;$$

which gives

$$W = a^2\pi D \frac{(l-m)\,(l+m+2a\tan.\beta) - \frac{a^2}{2}\left(\frac{1}{2}\cot.^2\beta + 1\right)}{l + 2a\tan.\beta.}$$

The numerical value of W appended to my solution seems to be erroneous. The equation

$$k = m\sin.\beta - a\cos.\beta,$$

or in numbers,

$$3 = 13\sin.\beta - \tfrac{3}{4}\cos.\beta,$$

furnishes two *positive* values of sin. β, and it appears that I have taken the wrong one. The error may be avoided as follows: Dividing by cos. β, we have

$$k\sec.\beta = m\tan.\beta - a,$$

or

$$k^2(1+\tan.^2\beta) = m^2\tan.^2\beta - 2am\tan.\beta + a^2;$$

from which we find

$$\tan.\beta = \frac{am + k\sqrt{a^2+m^2-k^2}}{m^2-k^2} = ,1095604.$$

$$\therefore \cot.\beta = 9{\cdot}1273854.$$

These values of tan. β, cot. β make $W=8{\cdot}17528$. The above expression for W does not seem to be identical with "Workman's" final equation (15). Its correctness may be verified as follows: Referring to page 125, we have the equation,

$$W=\frac{PN}{PM}\cdot F;$$

in which

$$PN=\frac{l}{2}\cos.\beta+a\sin.\beta+\frac{m}{2}\cos.\beta-\frac{a^2}{4}\cos.\beta\ \frac{\frac{1}{2}\cot.^2\beta+1}{l-m},$$

$$PM=\frac{l}{2}\cos.\beta+a\sin.\beta,$$

$$F=a^2\pi D\,(l-m),$$

Substituting these, we obtain the preceding expression.

I remain, yours, &c.,

SEPTIMUS TEBAY.

Preston, August 23, 1852.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—Three solutions of the Problem of the Exciseman's Staff having appeared in your Magazine, all, I believe, somewhat incorrect, I am induced to trouble you with a fourth. If I point out the errors of my predecessors, it is in no spirit of censoriousness, but to contribute as far as in me lies to the final settlement of this *vexata quæstio.*

Mr. Tebay's solution (No. 1499, page 345) seems to me erroneous by reason of some errors which have crept into the calculation, leaving it doubtful about what point he takes the moments, and omitting a term in the moment of W. One, at least, of his expressions by no means follows from the preceding steps, which may have resulted from inadvertence; but this is very bewildering to many who wish to master the solution. It is on this account that I have appended a correct solution on the principle of taking the moments of the whole fluid pressure.

Mr. Smith (No. 1504, p. 404) errs in taking the centre of gravity of displacement in the *axis* of the staff where it cannot be, unless the staff float with the axis vertical; and, 1, by adding a force $\pm$ F in equation (3) to a *moment* of force W . PM, to which Mr. Tebay justly objects. Mr. Tebay's remarks on the identity of the problem in question with the same problem when the staff is loosely connected to the side of the vessel by a hinge, are not, I believe, correct. The equation of moments is the same in both cases; but β is no longer known, but must be determined from this equation which also contains the unknown quantity m; the problem is therefore indeterminate, unless the depth of the surface of the fluid below A, the hinge be given; and thus another equation between the unknown quantities m and β be given. After these are found, the pressure on the hinge can be obtained immediately. Putting X = the resolved part of this pressure along the staff, and Y the resolved part at right angles to it, we have

$$\left.\begin{array}{l} X+W\sin.\beta-\mu V\sin.\beta=0 \\ Y+W\cos.\beta-\mu V.\cos.\beta=0 \end{array}\right\}$$

where V is the volume and μ the specific gravity of the displaced fluid; whence it appears that $\frac{x}{y}$ = tangent of angle, which the pressure on the hinge makes with the end of the staff, still = tan. β.

"Workman" (No. 1514, p. 124—126) errs in taking the pressure on the staff *vertical;* that is, in the direction of the side of the vessel, instead of perpendicular to the staff.

If R is the *normal* pressure, and therefore (using his notation) μR the friction, the vertical pressure = R sin. $\beta+\mu R$ cos. β, the ratio of which to the normal pressure is sin. $\beta+\mu$ cos. $\beta:1$, instead of $\cdot 1:\sin.\beta$ as he takes it.

He rightly observes, that the solution of the problem is incapable of both a *superior* and *inferior* limit; as our investigation, which we now subjoin, also shows.

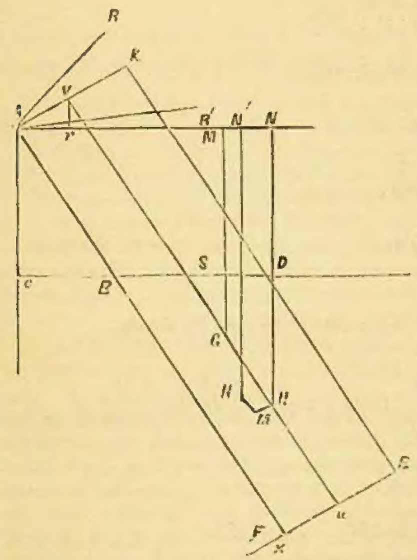
I am, &c..

INDAGATOR.

August 23, 1852.

Solution.

A F E K a section of the staff by a vertical plane through the axis V S U.



Let radius of base of staff $=a$, $l=$ length of axis, $m=$ length of that portion *not* immersed, $\mu=$ specific gravity of the fluid, $AC=h$ the depth of surface of the fluid below A, $\angle ABC=\beta$, $DE=b$. Let $\alpha=$ limiting angle of resistance between the staff and support at A, draw A R, A R′ making an angle α one above and the other below A K; then A R is the direction of the pressure at A when the staff is on the point of slipping downwards; and A R′ when it is on the point of slipping *upwards*. Through A draw the horizontal line A M N G: the middle point of V S U the centre of gravity of staff. H the middle point of $s\,u$; H′ the centre of gravity of volume immersed B F E D: G M, H N, and H′ N′ perpendiculars on A M N, and let $W=$ weight of staff, $V=$ volume displaced, the weight of which is equal to the resultant vertical pressure of the fluid upwards. Draw V r perpendicular on A N.

1. Let the staff be in a state bordering on motion by *slipping* downwards. Let P be pressure at A in direction AR. Then resolving all the forces *parallel* and perpendicular to AF, we have

$$\left.\begin{array}{l} -R\sin.\alpha+(W-\mu V)\sin.\beta=0 \\ R\cos.\alpha-(W-\mu V)\cos.\beta=0 \end{array}\right\}$$

Whence, eliminating R

$$\tan.\beta=\tan.\alpha \;\ldots\ldots\ldots\;(1),$$

$$\text{or } \beta=\alpha \text{ or } 180^\circ+\alpha$$

the former of these gives the angle $ABC=KAR$, and is the common case; the second gives the outward

$$CBF=180^\circ+FBD=180^\circ+KAR,$$

which is evidently the same case as the other.

2. Let it be in the state bordering on motion by slipping upwards. AR′ is now the direction of the pressure, and proceeding as before,

$$-R\sin.\alpha+(W-\mu V)\sin.\beta=0,$$

and $\qquad R\cos.\alpha-(W-\mu V)\cos.\beta)=0,$

or $\qquad \tan.\beta=-\tan.\alpha,$

this gives $\qquad \beta=-\alpha$ or $90^\circ+\alpha$.

The former value requires A to be below BC, or the end AK to be immersed, which is contrary to the conditions of the problem. The second value

$$\beta=90^\circ+\alpha,$$

makes

$$\angle CBA \text{ greater than a right angle,}$$

and ∴ A cannot rest on the side at all. Hence there is no case of equilibrium where the staff is on the point of sliding upwards, except in the particular case of $\alpha=0$, which gives a vertical position of the staff, and $W=\mu V$.

Returning to the first case, therefore, we have

$$\tan.\beta=\tan.\alpha\ldots.(1),$$

and forming the equation of moments about A, we have

$$W.AM=\mu VAN'=\mu V(AN-AN')\ldots\ldots(2),$$

and $\qquad AM=Ar+rM$

$$=a\sin.\beta+\frac{l}{2}\cos.\beta\ldots.(3),$$

$$AN=Ar+rM=a\sin.\beta+(l-\tfrac{1}{2}(l-m))\cos.\beta,$$

$$=a\sin.\beta+\tfrac{1}{2}(l+m)\cos.\beta\ldots\ldots(4),$$

and it remains to find the value of

$$\mu V \text{ and } \mu V.NN'.$$

Take the base FE of the cylinder for the plane of xy, the centre of base U for origin, and UFX for axis of x, and the axis of staff for axis of z; then the value V(BFED) is that contained between the surface of the cylinder, the base and the plane BD which cuts it making angle $90°-\beta$ with the base.

Hence the equation to the cylinder is

$$x^2+y^2=a^2 \dots\dots\dots\dots (5),$$

and the cutting plane

$$z-b=(a+x)\cot.\beta \dots\dots (6),$$

and an element of the volume

$$=z\,dy\,dx,$$

its moment about plane of

$$yz=x\,2\,dy\,dx,$$

its moment about plane of

$$xy=\tfrac{1}{2}z^2\,dy\,dx.$$

Hence

$$V=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}(b+a\cot.\beta+x\cot.\beta)\,dx\,dy,$$

$$=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}(l-m+2\cot.\beta)\,dy\,dx,$$

$$=2\int_{-a}^{a}(l-m+x\cot.\beta)\sqrt{a^2-x^2}$$

$$=\pi a^2(l-m)=\text{vol. cylinder axis SU} \dots\dots\dots (7).$$

Again; if $\bar{x}$ and $\bar{z}$ be co-ordinates of centre of gravity H'.

$$V.\bar{x}=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}x(l-m+x\cot.\beta)\,dy\,dx,$$

$$=\frac{\pi a^4}{4}\cot.\beta=\text{V.H}m \dots\dots (8),$$

$$V\bar{z}=\tfrac{1}{2}\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=-a}(l-m+x\cot.\beta)^2\,dy\,dx,$$

$$=\pi a^2\frac{(l-m)^2}{2}+\frac{\pi a^4}{8}\cot.^2\beta.$$

Now $$\pi a^2\frac{(l-m)^2}{2}=\text{V.UH evidently},$$

$$\therefore\quad \text{V.}m\text{H}'=\frac{\pi a^4}{8}\cot.^2\beta \dots\dots\dots (9);$$

$$\text{but V.NN}'=\text{V.}\{\text{H}m\sin.\beta+m\text{H}'\cos.\beta),$$

$$=\frac{\pi a^4}{4}\cos.\beta+\frac{\pi a^4}{8}\cos.\beta.\cot.^2\beta,$$

$$=\frac{\pi a^4}{4}\cos.\beta\left\{1+\tfrac{1}{2}\cot.^2\beta\right) \dots\dots\dots\dots (10).$$

$$\text{whence }\mu\,\text{V.AN}'=\mu\,\pi a^2(l-m)(a\sin\beta+\tfrac{1}{2}(l+m)\cos.\beta),$$

$$-\mu\,\frac{\pi a^4}{4}\cos.\beta\,(1+\tfrac{1}{2}\cot.^2\beta);$$

and the equation of moments becomes

$$W\left(a\sin.\beta+\frac{l}{2}\cos.\beta\right)-\mu\,\pi a^2.(l-m)(a\sin.\beta\ \tfrac{1}{2}\,\overline{l+m}\cos.\beta)$$

$$+\mu\ \frac{\pi a^4}{4} \cos.\ \beta\,(1+\tfrac{1}{4}\cot.^2\beta)=0;$$

$$\text{or } W\left(a+\ \frac{l}{2}\cot.\ \beta\right)=\mu\,\pi\,a^2\left\{(l-m)(a+\tfrac{1}{2}(l+m)\cot.\beta)-\frac{a^2}{4}\cot.\ \beta\ (1+\tfrac{1}{4}\cot.^2\beta)\right\} \ldots\ldots(11),$$

$$\text{Also } h=m\ \sin.\ \beta-a\ \cos.\ \beta \ldots\ldots\ldots(12).$$

m may be obtained by solving the quadratic in (11), and then h is given by (12).

This problem has been solved on the supposition that the staff is in the state bordering on motion; but the equilibrium is still possible for lower amounts of friction—that is, for smaller values of α, and consequently of β: the least value of which α is capable is zero, which gives the staff horizontal. The equation (11) becomes, under these circumstances,

$$(W-\mu\pi a^2\ (l-m))\ a=0,$$

or

$$W=\mu\pi a^2\,(l-m);$$

that is, the weight of the staff equals the weight of the fluid displaced, which it should be; and the weight of staff is capable of all values between this value and that obtained by putting β=the *limiting* angle of resistance. Unless, therefore, it be known that the staff be in the state bordering on motion, the problem is *indeterminate*, as Mr. Smith rightly observes. If, however, m is given, and also b, then β is found by 12, and therefore W can be completely found by (11). If the angle β could be observed, since it must always be equal to α, which depends on the amount of friction, the problem is fully determinable.

Mr. Tebay's solution (if the moments were all taken about A, which they are not) ought to agree with the above. It does not, however, on account of some errors which have crept into the calculation. The true solution, according to his method is as under:

Everything remaining as before, let x be any distance measured along the axis from U, and ϕ the $\angle$ which any radius makes with the radius in the vertical plane parallel to U F.

Then depth of any point in the horizontal chord $2a$ sin. ϕ of the immersed circular end $=b$ sin. $\beta+a$ cos. β (1 + cos. ϕ)

$$=\sin\beta\,(b+a\ \cot.\ \beta+a\ \cot.\ \beta\ \cos.\ \phi),$$

$$=\sin.\ \beta\ (l-m+a\ \cot.\ \beta\ \cos.\ \phi),$$

and the pressure at this point

$$=\mu\ \sin.\ \beta\ (l-m+a\ \cot.\ \beta\ \cos.\ \phi),$$

and the element of the area whose length is chord $2a$ sin. ϕ and breadth a sin. $\phi d\phi$

$$=2a^2\sin^2\phi d\phi\,;$$

the whole pressure on this chord

$$=2a^2\sin.\ \beta\sin.^2\phi\,(l-m+a\cot.\ \beta\cos.\ \phi)\ d\phi,$$

and acts through a point in the diameter EF whose distance from F

$$=a\ (1-\cos\ \phi)=2a\ \sin^2\frac{\phi}{2}.$$

Hence moment of the pressure on this chord from the lower end F.

$$=4a^3\ \sin\ \beta\ \sin^2\ \phi\ \sin^2\ \frac{\phi}{2}\ (l-m+a\ \cot\ \beta\ \cos\ \phi)\ d\phi.$$

Hence the whole moment, which is evidently the same as the moment of the same force about A

$$=4a^3\ \sin\ \beta\int_0^\pi \sin^2\ \phi\ \sin^2\frac{\phi}{2}\ (l-m+a\ \cot\ \beta\ \cos\ \phi)\ d\phi$$

$$=\pi a^3\ \sin\ \beta\ \left(l-m-\frac{a\ \cot\ \beta}{4}\right)\ldots\ldots\ldots(1).$$

Again; the depth of any point in the curved surface below the surface of the fluid at the end of the horizontal chord $2a$ sin ϕ of any circular section

$$=(l-m-x)\ \sin\ \beta+a\ \cos\ \beta\ \cos\ \phi$$

$$=\sin\ \beta\ (l-m+a\ \cot\ \beta\ \cos\ \phi-x)=\sin\ \beta\ (u-x).$$

Also an element of the surface

$$=a.d\phi.dx\,;$$

$\therefore$ Pressure on this element

$$= a \sin \beta \,(u-x)\, d\phi . dx\,;$$

and there is an equal pressure at the other end of the same horizontal chord, the resultant of which is a single pressure

$$2a \sin \beta \cos \phi \,(u-x)\, d\phi . dx,$$

acting parallel to FU: the perpendicular distance of this from end $A = l - x$.

Hence the moment of this pressure about A

$$= 2a \sin \beta \cos \phi \,(u-x)\,(l-x)\, d\phi . dx.$$

$\therefore$ moment of all such pressures which equals the moment of resultant pressure on the curved surface about

$$A = 2a \sin \beta \int_0^{\pi} \int_{x=0}^{x=u} \cos \phi \,(u-x)\,(l-x)\, d\phi . dx$$

$$= a \sin \beta \int_0^{\pi} \cos \phi \; u^2 \left(l - \frac{u}{3}\right) d\phi . dz$$

$$= \frac{a \sin \beta}{3} \int_0^{\pi} \cos \phi \,(l - m + a \cot \beta \cos \phi)^2$$

$$\times (2l + m) - a \cot \beta \cos \phi)\, d\phi$$

Expanding and performing the integrations which depend only on integrals of the form

$$\int_0^{\pi} (\cos \phi)^m \, a\phi$$

this

$$= \frac{\pi a^2}{2} \sin \beta \cot \beta \left\{ (l-m)\,(l+m) - \frac{1}{4}\, a^2 \cot^2 \beta \right\}$$

$$= \frac{\pi a^2}{2} \cos \beta \left\{ (l-m)\,(l+m) - \frac{1}{4}\, a^2 \cot^2 \beta \right\} \ldots\ldots (2)$$

But (1) + (2) = whole moment of the fluid d; pressure about A

$$= \mu \pi a^3 \,(l-m) \sin \beta - \mu \frac{\pi a^4}{4} \cos \beta$$

$$+ \mu \frac{\pi a^2}{2} (l-m)\,(l+m) \cos \beta - \mu\, \frac{\pi a^4}{8} \cos \beta \cot^2 \beta$$

$$= \mu \pi a^2 \,(l-m) \sin \beta \left\{ a + \frac{1}{2}\,(l+m) \cot \beta \right\} - \mu \frac{\pi a^4}{4} \cos \beta \left(1 + \frac{1}{2} \cot^2 \beta \right) \ldots (3)$$

but this equals the moment of the weight of the staff about end A

$$= W \left(a \sin \beta + \frac{l}{2} \cos \beta \right).$$

Hence equating and dividing by $\sin \beta$, we have

$$W \left(a + \frac{l}{2} \cot \beta \right) = \mu \pi a^2 (l-m) \left(a + \frac{1}{2}\,(l+m) \cot \beta \right)$$

$$- \mu \frac{\pi a^4}{4} \cot \beta \left(1 + \frac{1}{2} \cot^2 \beta \right) \ldots . (4),$$

which is the same as equation (11) in the first solution.

The remainder of the solution is the same as Mr. Tebay gives, and agrees with the first solution.

(Supplementary Remarks to Solution.)

Since forwarding the above solution of the "Exciseman's Staff Question," Mr. Smith's rejoinder to "Workman," in the last Number of the *Mechanics' Magazine*, has come under my notice. That gentleman, who is very liberal with his stric-

tures, would do well to make sure of his own mathematics—I much fear that his remarks on the mathematical attainments of the coterie of amiable gentlemen are not inapplicable to himself. His two former errors which have been repeateldy pointed out, and by "Workman," certainly, in a very indulgent manner, yet stand uncorrected; and I cannot see that he much improves his position by his rejoinder. He adopts "Workman's" error of supposing that part of the pressure, which is independent of the friction on the body, acts in the direction of the prop instead of in the direction of the normal to the surface, and makes this the basis of his reasoning. It seems that both he and "Workman" have to be taught, that if there be no friction, the pressure on the surface, in case of equilibrium, must be in the direction of the normal; otherwise there would be a resolved part along the tangent which must produce motion. The effect of friction is found by experiment to be the same as if this normal pressure remained the same, and an additional pressure acted in the direction of the tangent proportional to the normal pressure.

Mr. Smith's remarks on "rolling friction" are quite beside the question. The equation of moments provides against the motion of rolling, and this equation holds until the point P moves; that is, until the staff slides. Of course, in that case the staff will have a motion of rotation, because, otherwise, too much of it would be immersed in the fluid, and the fluid pressure exceed its due amount; but there would be no "rolling friction" called into play, because for this there must be a surface rolling on a surface, whereas the motion in this case would be that of a surface sliding on a point, or rather line of support; and the friction is the same whether the surface has also a motion of rotation or not.

I do not concern myself with the spirit in which this controversy has been carried on; but I quite sympathise with Mr. Smith in his remarks on the villanous habit so much in vogue among certain little cliques, of bespattering each other with the most fulsome expressions of praise when opportunity offers, in the hope, doubtless, that some of it, at least, will stick. Let every one have "a clear stage and no favour;" but away with such paltry attempts to earn a name, which, if deserved, is only soiled by so vile an artifice; and, if undeserved, is prejudicial to the interests of science.

I.

THE WANDSWORTH TELESCOPE.

[A correspondent of the *Times* furnishes the following rather copious statement of errors in the account of this stupendous structure which we published last week, *ante*, p. 175. ED. M. M.]

Sir,—I was sorry to read in your valuable paper of Monday last some mistakes respecting the gigantic telescope on Wandsworth-common. Your correspondent has given a fair statement about all concerned in this instrument, with but one exception, namely, your humble servant—who was the first to undertake to make this telescope, and the object-glass and all the optical work were contracted for and worked by me. If there is any merit in this great undertaking, let me have my share of publicity. The mistakes to which I allude in your correspondent's report are as follows:

1. Two glasses are used, one of flint and the other of plate-glass, either of which the observer may use at his option.

Such is not the case; and, for the better information to the public, I will explain how the two lenses are used.

The plate-glass lens has a positive focal length of 30 feet 1½ inches; its refractive index is 1,5103. The flint glass lens has a negative focal length of 49 feet 10¼ inches; and the refractive index of this glass is 1,6308. These two lenses, placed in contact, are used in combination, and constitute the achromatic object-glass, the focal length of which is 76 feet to parallel rays—that is, to all celestial objects, and it would be 85 feet focal length only to objects at about 700 feet distance from the object-glass.

The next mistake, and which is (no doubt) a typographical error, is, where it reports that double stars in the Great Bear have been separated 50° or 60° by this telescope, &c.! The largest eyepiece made for this instrument subtends to an angle of 30 minutes, its magnifying power is 125, and the diameter of the lenses 8 inches, which is about the size of the image of the full moon.

The next size eyepiece is 4 inches diameter, subtends to an angle of 15 minutes, and magnifies 250. The range of eyepieces then vary from angles of 9 minutes to 50 seconds, and the magnifying powers from 500 to 3,000. Therefore you will perceive that, with such eyepieces, double stars cannot be separated 50° or 60°. I have seen stars separated as many seconds.

These large eyepieces, with the rack-work motion, are not yet attached to the telescope

—smaller ones are being used only till the object-glass is properly adjusted.

I am, Sir, your obedient
Humble Servant,
THOMAS SLATER.

4, Somers-place West, near Euston-square, August 24, 1852.

EXPERIMENTS ON ANCHORS—THIRD SERIES. SEE ANTE, P. 129.

Commodore the Hon. Montagu Stopford, the Chairman of the Committee of Management, stated to the gentlemen present, that the object of the *modus operandi* on this occasion was to test the canting of the anchors, their quickness in taking hold of, biting, and deepening into the ground, and also their holding powers at short-stay peak. Trotman's, the Admiralty (Sir W. Parker's), Lennox's, and Mitcheson's anchors were stationed on the port side; Aylen's, Rodgers's Exhibition prize anchor, Honiball's (Porter's), and Isaac's (American), on the starboard side of the *Royal Escape* lighter, being secured in a similar manner to that adopted on board ship. The ends of a 25-fathom length of $1\frac{3}{8}$ inch chain cable were shackled on to the competing anchors port and starboard, with a large traversing iron block in the centre; this, again, was brought to a chain pendant over the horn or derrick of a dockyard lighter, and, with a fourfold purchase attached, brought to the capstan. At a signal from the gallant commodore, the lashings holding the first pair of competing anchors (Trotman's and Aylen's) were cut, and they dropped in 10 fathoms water. The heaving-in process commenced immediately, Trotman's bringing Aylen's home.

The next trial was between Lennox's and Isaac's (American) anchors, the former beating the latter considerably.

Lieutenant Rodgers's Exhibition prize anchor was then placed in competition with the new Admiralty anchor, constructed on the plan of Sir W. Parker, the former evincing a superiority over the latter. With this terminated the day's proceedings.

Second Day's Trial.—Saturday, August 21.

The experiments were resumed, commencing with the testing together of Honiball's (Porter's) and Mitcheson's. In this instance it was discovered that both anchors had fouled their stocks in dropping, and, as consequently no fair result could be arrived at, the Committee decided that another trial should take place between them.

Trotman's and Lennox's anchors having been placed in their respective positions to be tried against each other, they were hove upon, Trotman's bringing his adversary's home. The further proceedings were then adjourned until Tuesday, the 24th inst., in order that the successful anchors in the above trials might be placed in the manner requisite for competition, with the view of determining the best among them.

Third Day's Trial.—Tuesday, August 24.

Rodgers's Exhibition prize and Mitcheson and Son's anchors, having been previously dropped in their proper positions, were forthwith hove upon. At length Rodgers's came up, when it was discovered that it was fouled in the stock. A consultation was then holden, when it was determined that another trial should take place.

Returning to the lighter, the same two anchors were again let go. On the purchase being applied the strain appeared to be very great. After two hours' heaving in, Mitcheson's anchor brought Lieutenant Rodgers's home. Proceedings then adjourned until the following morning.

During the progress of this day's trials the following resolution of the Committee of Management was handed to the respective owners of anchors:—

"That as it is desirable the Report of the Committee should be accompanied by correct models of the competing anchors, so as to serve as records of the present state of anchor art, the owners of the several anchors be invited to furnish correct models, in gun-metal, on the scale of three-quarters of an inch to the foot."

Fourth Day's Trial.—Wednesday, Aug. 25.

The whole of this day was occupied with the testing together of Honiball's (Porter's) and Mitcheson's anchors, which resulted in the former being hove up first, after a most severe and protracted struggle. This brings Mitcheson's in competition with Trotman's (improved Porter's), on the completion of which the present series of trials will be brought to a close.

Fifth Day's Trial.—August 26.

The operations commenced this day with the trial of Trotman's and Mitcheson's anchors. Trotman's having been let go two days previously, its stock had become imbedded, whereby, it is supposed, its canting was prevented, and it came home first. Mitcheson's had been dropped on the morning of this day. The Committee, in consequence, decided that this was no trial, and ordered the anchors to be relaid for competition.

While this was going on, an interesting contest took place between Aylen's and Lennox's anchors, in which the former was victorious.

Sixth and Last Day's Trial.—August 27.

Trotman's and Mitcheson's anchors having been placed in their relative positions, Trotman's to port and Mitcheson's to starboard, the heaving-in process commenced, and ended in Trotman's being brought home, a result which (with the exception of one trial only of the present series) has occurred to all the anchors the lot of which it was to have a position to port.

The third series of experiments are thus brought to a most unsatisfactory close, such as will tend rather to confuse than assist the Committee in forming a just estimate of the relative merits of the competing anchors. In the trials which took place in the dockyard, and on the beach, Honiball's (Porter's) beat Mitcheson's; and Trotman's (improved Porter's) proved successful against both Honiball's and Mitcheson's. Some explanation is, therefore, necessary to render these conflicting results intelligible.

In recording the present trials, it must be observed that all the anchors placed on the port sides were beaten by those on the starboard, with the exception of the first pair tested together (Trotman's and Aylen's), in which instance Trotman's was successful. It fell to the lot of Mitcheson's to be placed on the extreme starboard, so that its competitor was necessarily dropped into ground broken up by the previous trials (10 in number), making 20 furrows within a quarter of a circle converging to a common centre, viz., the purchase on board a dockyard lump made fast by the stern to the moorings of a first-rate man-of-war.

The above adverse circumstances did not occur in the former series of trials, as the receding tide allowed the competing anchors to be placed in new and alternate positions, without the possibility of their getting into the furrows made by any previous trials.

The four best anchors, as proved by the three preceding trials, will be selected for testing at the Nore, on Friday, the 10th inst., when steam power will be employed, and their other qualifications besides holding properties, viz., quickness in taking the ground, holding on, bringing up short, fouling, sweeping, &c., will be thoroughly tried.

These important points being ascertained, the anchors will be taken to Woolwich to undergo hydraulic pressure as a proof of their relative strength.

THE TELEGRAPHIC LINES OF THE WORLD.

BY DR. L. TURNBULL.

(From the "Journal of the Franklin Institute" for July.)

United States.

In giving an account of the number of telegraphic lines, it will be proper to place the United States as first on the list, from the number and extent of the lines, and from the extensive use made of them in every department, both for business and pleasure. Still it will be but an approximation to the number, for they are like the spider's web, forming a complete network over the length and breadth of the land, from the extreme north-eastern point to the western boundary of Missouri, adjoining the Indian territory. A continuous line of telegraph now extends from the verge of civilization on the western frontier (east of the Rocky Mountains) to the north-eastern extremity of the United States; and the time is not far distant when we shall have a telegraph from the Mississippi river to San Francisco. This is no fancy sketch, as the route is already selected for the California line, and a most interesting Report was presented to the Senate of the United States in the Session of 1851, by the Committee on Post-offices and Post-roads.

"The route selected by the Committee is, according to the survey of Captain W. W. Chapman, U. S. Army, one of the best that could be adopted, possessing as it does great local advantages. It will commence at the City of Natchez, in the State of Mississippi, running through a well-settled portion of Northern Texas, to the town of El Paso, on the Rio Grande, in latitude 32°; thence to the junction of the Gila and Colorado rivers, crossing at the head of the Gulf of California to San Diego, on the Pacific; thence along the coast to Monterey and San Francisco. By this route, the whole line between the Mississippi River and Pacific Ocean will be south of latitude 33°; consequently, almost entirely free from the great difficulties to be encountered, owing to the snow and ice on the northern route, by the way of the South Pass, crossing the Sierra Nevada Mountains in latitude 39°. The whole distance from the Mississippi to San Francisco will be about 2,400 miles."

The great benefits to be derived the Report fully and ably sets forth, whether in a military, commercial, or social point of view.

"In a commercial point of view, the line in question assumes a gigantic importance, and presents itself not only in the attitude of a means of communication between the opposite extremes of a single country, how-

ever great, but as a channel for imparting knowledge between distant parts of the earth. With the existing facilities, it requires months to convey information from the sunny climes of the East to the less favoured, in point of climate, but not less important regions of the West, teeming as they do with the products of art and enterprise. Let this line of wires be established, and the Pacific and Atlantic Oceans become as one, and intelligence will be conveyed from London to India in a shorter time than was required ten years since to transmit a letter from New York to Liverpool.

"Nor does the importance of the undertaking claim less interest, when regarded in a social point of view. California is being peopled daily and hourly by our friends, our kindred, and our political brethren. The little bands that a few centuries since landed on the western shores of the Atlantic, have now become a mighty nation. The tide of population has been rolling onward, increasing as it approached the setting sun, until at length our people look abroad upon the Pacific, and have their homes almost within sight of the spice groves of Japan. Although separated from us by thousands of miles of distance, they will be again restored to us in feeling, and still present to our affections, through the help of this noiseless tenant of the wilderness."

In the *Congressional Globe* of April 6, 1852, Mr. Douglass presented the memorial of Henry O'Reilly, proposing a system of intercommunication by mail and telegraph, between the Atlantic and Pacific States. All he asks is permission to establish a telegraphic line from the Mississippi Valley, where the wires now terminate, to the Pacific Ocean, and to be protected by a line of military posts, so that he can keep up the communication for the benefit both of the Government and of the public. Mr. O'Reilly states in this memorial, that within two years from this time, with this line completed, he would be able to deliver the European news on the shores of the Pacific within one week from the time it left the European Continent. The motion was referred to the Committee on Territories.

These are but a part of the advantages set forth in the Bill, with a strong recommendation from the Committee for its passage.

The authorities of Newfoundland have granted to Mr. H. B. Tibbatts and associates, of New York, the exclusive right to construct and use the magnetic telegraph across that island for the period of thirty years. The grant is designed to facilitate Mr. Tibbatts in his scheme for the establishment of steam and telegraphic communication between New York and Liverpool or London, *in five days*. The telegraph is to extend from New York to St. John's, from whence a line of steamers is to run to Galway, where another line of telegraph is to commence, extending to London. This latter line will, it is said, be completed during the current year. The distance from St. John's to Galway is 1647 miles, or about five days' sail.

There are numerous lines in actual and successful operation under the title of Morse, House, and Bain, each giving every facility to the business man.

A recent letter from Charles T. Chester, Esq., telegraphic engineer, who is connected with the Morse Line, the first and most extensive one in the United States, gives the following statistics of the facilities for the transmission of intelligence along their lines in the chief cities of this country.

"Two Morse wires run to Boston, that to Buffalo, five to Philadelphia, four to Washington, and two on to New Orleans; on the Western and Canada routes there is generally but one."

The above list will give an approximation of the number of the Morse lines, obtained principally from Mr. Chester, and from the work of Disturnell, published January, 1852. The following is a list of the names of the Companies:

1. Washington and New Orleans Telegraph, organised under Morse's patent; tariff of charges, 2 dollars; from Washington to New Orleans, 1716 miles, with 19 stations: no charge for address, signature, or date; Daniel Griffin, Esq., President.

2. Atlantic and Ohio Telegraph Line; Philadelphia-office, 101, Chestnut-street; tariff of charges, 1 dollar 30 cents. to Milwaukie, Wisconsin; from Philadelphia to Milwaukie, 812 miles, with 76 stations.

3. The Magnetic Telegraph Company Line, extending from New York to Washington City; office, No. 5, Hanover-street, corner of Beaver-street, New York; rates of charges, 50 cents.; from New York to Washington, 245 miles, with 10 stations. Also, from New York to New Orleans, 2 dollars 50 cents.; but when a communication exceeds 100 words, the price on all words exceeding that number will be reduced one-third.

4. New York, Albany, and Buffalo Telegraph; office, No. 16, Wall-street, New York, up stairs; from New York to Niagara, 500 miles; 65 cents. This line connects with numerous towns and cities in Vermont, Canada, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa, Tennessee, and Kentucky; with 76 stations.

5. Troy and Canada Telegraph; from Troy to Montreal, with 14 stations.

6. Magnetic Telegraph Line, from Boston to Halifax, N. S., with 12 stations.

7. New York and Boston Magnetic Telegraph Association, organized under Morse's patent; office, No. 5, Hanover-street, near Beaver-street, New York; from Boston, Mass., to Halifax, N. S.; with 35 stations. Also, from New York, *viâ* Bridgeport, to Birmingham, Connecticut, with 11 stations; 50 cents for ten words.

The first American telegraphic line was established in May, 1844, between Washington and Baltimore, over a length of 40 miles.

The line from Washington to Baltimore also proceeds to Philadelphia and New York, over an extent of 250 miles. It reached Boston in 1845, and became the great line of the North, from which branched two others; one, the length of 1,000 miles, from Philadelphia to Harrisburgh, Lancaster, Pittsburg, Ohio, Columbus, Cincinnati, Louisville (Kentucky), and St. Louis, (Missouri); the other, the length of 1,300 miles, from New York to Albany, Troy, Utica, Rochester, Buffalo, Erie, Cleveland (Ohio), Chicago (Illinois), and Milwaukie (Wisconsin).

A fourth line goes from Buffalo to Lockport, Queenstown, the Lakes Ontario and Erie, the Cataracts of Niagara, Toronto, Kingston, Montreal, Quebec, Halifax, and the Atlantic Ocean, over an extent of 1,395

Two lines South; one from Columbus to New Orleans, by Cincinnati; the other from Washington to New Orleans, by Fredericksburg, Charleston, Savannah, and Mobile. The first is 1,200 miles long, the second 1,122. This line has been extended West to Independence, Missouri.

In April, 1852, direct communication was had between the New Orleans Telegraph office and the office of the New Orleans line in Hanover-street, New York, the whole extent of near 3,000 miles of wire having been successfully worked in a single circuit. Despatches were sent from New York to New Orleans 60 minutes ahead of time.

The House Printing Telegraph has only been in Operation since 1846, but even in that short time has spread itself over a large portion of the United States, working to the entire satisfaction of our business community, and wherever found, exciting the admiration of the curious, being able to print in Roman capitals communications in almost every language.

This line consists of the Boston and New York Telegraph Company, using the House Printing Telegraph; about 600 miles of wire, two wires; stations at Boston, Massachusetts; Providence, Rhode Island; Springfield, Massachusetts; Hartford, Connecticut; New Haven and New York.

A line will be constructed to connect with this Boston line, running from Springfield, Massachusetts, to Albany, New York; there to intersect the New York and Buffalo line, using the same instruments, extending from New York to Buffalo, a distance of 570 miles. One wire is now in operation, connecting with Poughkeepsie, Troy, Albany, Utica, Syracuse, Lyons, Rochester, Albion, Lockport, and Buffalo; and another wire, nearly completed the same distance. This line is to continue to St. Louis, Mobile, connecting with Cleveland, Cincinnati, Louisville, and St. Louis, which will be completed the entire distance in 1852; forming the longest line in the world, under the direction of one Company, the whole length being 1,500 miles.

The New Jersey Magnetic Telegraph Company, using the House instruments, and the first line of this kind ever put in operation, extends from Philadelphia to New York; one wire, 132 miles; and another now being put up, for this information, I am indebted to the politeness of William J. Phillips, Esq., Telegraphic Engineer on the House line at Philadelphia, making the whole number of miles 2,802; rate, 25 cents for the first ten words from Philadelphia to New York.

The Atlantic and Pacific Telegraph range, under the arrangement of Henry O'Reilly, Esq., using a modification of Bain's Chemical Telegraph and Morse's instrument, from New York to Washington, and from New York to Boston. Also, the first division, constructed eastward of the Mississippi, known as the "Atlantic, Lake, and Mississippi Telegraph," extending to the Atlantic, and connecting nearly all principal cities and towns between the Canadian frontier and the Mexican Gulf—embracing the Ohio and Mississippi valleys, as well as the Lake country; about 6,000 miles constructed, and 3,000 miles contracted for construction.

The second division, westward of the Mississippi, to include the "Mississippi and Pacific Telegraph," of which about 500 miles of river distance, embracing the principal towns along the Missouri, between St. Louis and Fort Leavenworth, is contracted for construction, additional to other extensions in different quarters, west of the Mississippi, to be extended from Fort Leavenworth to San Franscisco, when Congress authorizes the extension through the public domain.

The Bain Line, now a Morse Line, Mr. Henry Rodgers, General Superintendent from New York to Washington, has lately constructed, at an expense of 10,000 dollars, spars 310 feet high, at the Palisades and Fort Washington, ten miles above the city

of New York, for the purpose of sustaining their wires over the river, instead of the method formerly employed, by passing the current through the water, by wires laid across the North River. He considers this method, by means of suspension on spars, as being more permanent and durable. The price of telegraphic dispatches by this line is the same as the others. They have offices in Boston, Providence, New York, Philadelphia, Wilmington. Baltimore, and Washington.

The Bain lines in the United States are as follows:—

One from Louisville to Memphis, called an O'Reilly Line, and contemplate using the same instrument to New Orleans on the same line.

One from New York to Boston; two wires.

One from Boston to Portland, Maine.

And one from New York to Buffalo: two wires.

The profits to the stockholders amount to from three to six per cent. per annum. The usual expense of constructing these lines varies from 100 to 200 dollars per mile.

List of the Morse Telegraph Lines in the United States.

		Miles.
1.	Washington to New Orleans, by way of Richmond, Virginia	1,716
2.	Washington to New York, by way of Baltimore and Philadelphia, 5 lines, each 250 miles	1,250
3.	Harper's Ferry to Winchester, Virginia	32
4.	Baltimore, by way of Pittsburgh and Wheeling, to Cumberland	324
5.	Baltimore to Harrisburg, by way of York, Pensylvania	72
6.	York to Lancaster, by way of Columbia, Pensylvania	22
7.	Philadelphia to Lewistown, Delaware	12
8.	Philadelphia to New York, 6 lines, each 120 miles	720
9.	Philadelphia to Pittsburg, by way Harrisburg	309
10.	Philadelphia to Pottsville, by way of Reading	98
11.	Reading to Harrisburg	51
12.	New York to Boston, by way of New Haven, &c., 2 lines, each 240 miles	480
13.	New York to Buffalo, by way of Troy and Albany, 5 lines, each 500 miles	2,500
14.	New York to Fredonia, N. Y., by way of Lake Erie, Newburg, and Oswego	450
15.	Bridgeport, Connecticut, to Bennington, Vermont, by way of Pittsfield	150
16.	Boston to Newburyport, by way of Salem, Massachusetts	34
17.	Boston to Portland, by way of Dover	110
18.	Worcester to New Bedford, by way of Providence	97
19.	Worcester to New London, by way of Norwich	74
20.	Portland to Calais, Maine	260
21.	Calais to St. John's, New Brunswick	75
22.	Troy to Whitehall, by way of Salem	72
23.	Troy to Montreal, Canada, by way of Rutland and Burlington	278
24.	Syracuse to Oswego, New York	38
25.	Auburn to Elmira, by way of Ithaca, New York	75
26.	Binghampton to Ithaca, by way of Oswego, New York	48
27.	Buffalo to Queenstown, Canada, by way of Lockport	48
28.	Buffalo to Milwaukie, Wisconsin, by way of Lake Eric and Chicago, Illinois	812
29.	Queenstown to Montreal, by way of Toronto and Kingston	466
30.	Montreal to Quebec	180
31.	Cleveland to Pittsburgh, by way of Alton, Illinois	150
32.	Pittsburg to Cincinnati, Ohio, by way of Columbia	310
33.	Pittsburg to Columbia	680
34.	Columbia to Memphis, Tennessee, by way of Wheeling	205
35.	Columbia to New Orleans, by way of Tuscumbia and Natchez	638
36.	New Orleans to Balize, at the mouth of the Mississippi	90
37.	Columbia to Chilicothe, Ohio	45
38.	Cincinnati, Ohio, to Maysville, Kentucky, by way of Ripley	60
39.	Cincinnati to St. Louis, Mobile, by way of Vincennes	410
40.	St. Louis to Chicago, by way of Alton, Illinois	330
41.	Alton to Galena, by way of Quincy	380
42.	Quebec to Halifax	700
43.	St. Louis to Independence, Mobile	25
44.	New York to New Orleans	3,000
	Total	17,283

Making in all the lines—

House Line	2,802	miles.
O'Reilly Line, using in most of the offices the modified Bain instrument —part of the O'Reilly Line using the Morse instrument	6,000	,,
Morse Line	17,283	,,
Bain Line	1,092	,,
Total number of miles in the United States	27,177	

(*To be continued.*)

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 2, 1852.

WILLIAM STIRLING LACON, of Great Yarmouth, Norfolk, gentleman. *For improvements in the means of suspending ships' boats, and of lowering the same into the water.* Patent dated February 23, 1852.

The object of this invention is so to suspend ships' boats at the sides or the stern of a vessel, that in the case of any sudden emergency, as the conflagration or the foundering of a vessel, her boats may be readily lowered and put to sea, without the risk of the tackles, or other contrivances which connect the boats to the ship, retarding the operations of lowering and floating them clear of the ship.

The manner in which the patentee overcomes the difficulties hitherto attendant on the lowering of ships' boats during tempests, on dark nights, and at periods of excitement and danger, is by suspending the boats from chains or ropes, which pass over the davits of the ship, and thence down to a winch or windlass, round which they are wound, but are attached thereto, in such a manner that when the winch is free to revolve, the ropes or chains will unship or disengage themselves from their attachment by their own weight. By this means, he prevents the possibility of the ship, in its onward progress through a rough sea, dragging forward a lowered boat, and capsizing or swamping it; the weight of the chains or ropes, to say nothing of the resistance of the boat, being sufficient to disconnect them from the winch, and thereby render the boat free of the ship.

Fig. 1 represents, in side view, a boat suspended, according to these improvements,

Fig. 1.

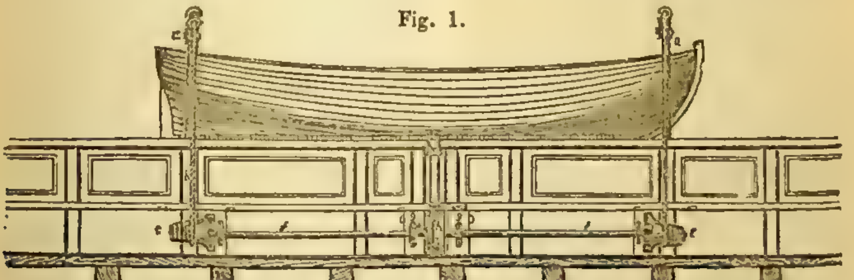


Fig. 2. Fig. 4.

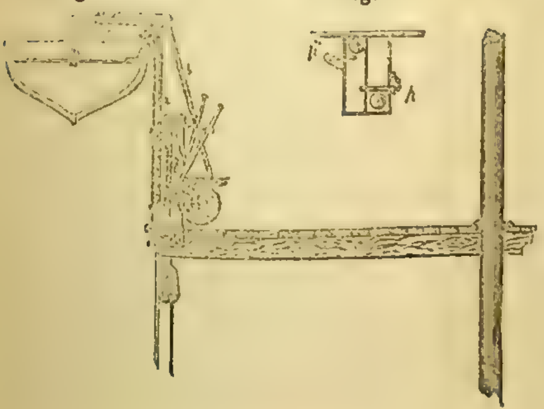
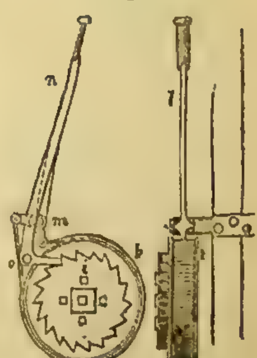


Fig. 3.



from the davits at the side of a ship, and also the apparatus employed for lowering the boat into the water, as fitted to the deck of a ship; and fig. 2 is a cross section of the same. In these figures *a a* are two davits or iron brackets, firmly secured to the bulwarks of the ship, and provided with sheaves or friction-pulleys, over which the ropes or chains *b b* for supporting the boat pass. The boat may be hoisted up at sea, if desirable, by means of the ordinary tackle; and when thus hoisted up, may be permanently retained in the desired position, by attaching the ropes or chains to the boat by the ordinary method in use.

The ropes or chains *b b* pass down from the davits to conical barrels *e e*, and are connected thereto by the last link in each chain, or an eye at the extremity of the rope, hooking on to a curved pin, projecting from the periphery of the barrel. These barrels are mounted on a shaft *f f*, which turns in bearings in the bracket-pieces *g g*.

The barrels *e e* are caused to rotate by the means hereafter described, for the purpose of tightening the suspending chains or ropes, and causing them to sustain the weight of the boat. The tackles, before mentioned as employed for hoisting up the boat, are then removed. At about the middle of its length, the shaft *f* carries a large friction-pulley *h h*, to which a ratchet-wheel *i i* is affixed. Around this pulley *h* a friction-strap *k k* is placed, and the ends of the strap are joined to a lever *l*, which works on a fulcrum pin *m* (see fig. 3). Into the teeth of the ratchet-wheel a catch, projecting from a lever *n*, which works on a pin *o*, takes for the purpose of preventing the running down of the chains or ropes *b b* by the rotation of the barrels, and is kept forward in its place by means of a spring *q*. The levers *l n* are set fast by means of the pins *p p** [(see fig. 4), which are readily withdrawn when the apparatus is to be brought into operation.

Let it now be understood that the boat, which has been raised to the position shown in the drawing, is required to be lowered into the water. The seaman to whom this duty is assigned, first pulls forward the lever *l*, in order to make the friction-strap *k* retain its hold of the friction-pulley *h*, and thus prevent the premature revolution of the shaft *f*. He then thrusts back the lever *n*, and releases the catch from the teeth of the ratchet-wheel *i*, the lever end being kept back by means of the pin *p**, as shown in fig. 5. On loosening the gripe of the friction-strap *k*, the boat will descend by its own gravity, and cause the chains or ropes to unwind from the barrels *e e*. When the boat has reached the water, the weight of the chains or ropes will, if the shaft *f* is still free to revolve, pull round the barrels, until by the slipping of the last link of each chain (or the eye at the extremity of the rope) from the projecting pin of its respective barrel, the ropes or chains fall away from the ship, and consequently free the boat of its connection with the ship. In order to prevent the boat from running down into the water too rapidly, it is only necessary for the seaman to keep the friction-trap in contact with the pulley *h*, by holding the lever *l* in its forward position, and thus any requisite amount of retardation may be put on the rotation of the barrels *ee*, and consequently on the descent of the suspending chains or ropes. If desirable, the shaft *f* may be furnished with a cog-wheel for the purpose of gearing into a pinion mounted on a short shaft provided with a winch handle, by turning which the boat may be hoisted up, or the winding of the suspending ropes or chains *b b* on to the barrels may be effected either when the ropes or chains are connected to or are free of the boat, or the ordinary hand-spike may be used to raise the boat to its elevated position instead of employing the tackles as at present.

Claims.—1. The suspending of ships' boats by chains or ropes, which are capable of disengaging themselves by their own weight from the ship when once the lowering of the boat is accomplished.

2. The employment of a friction pulley and friction strap, or other analogous contrivance for regulating the descent of ships' boats into the water.

3. The means hereinbefore described for running out the suspending chains or ropes uniformly, whereby the dangers consequent on lowering one end of a boat quicker than the other are avoided.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agent. *For improvements in windmills.* (Being a communication.) Patent dated February 23, 1852.

This invention has relation to what ar- known as "horizontal windmills," and consists of the improved method of construction represented in figs. 1, 2, and 3 of the engravings; fig. 1 being an elevation of the improved windmill complete; fig. 2 a horizontal section of the same; and fig. 3 a side view of the revolving parts of the mill. AA is a platform erected at a convenient height above the level of the ground. BB is an octagonal or other shaped windhouse which is raised on the platform A. The centre part of this windhouse is formed so as to allow the revolving part or parts of the mill to work within it. CC are partitions by which the wind blowing against

the sides of the windhouse is directed into the interior. The partitions are placed tangentially to the circumference of the revolving part of the mill, and the passage for the

Fig. 2.

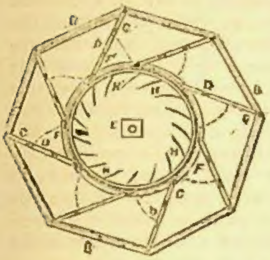


Fig. 3.

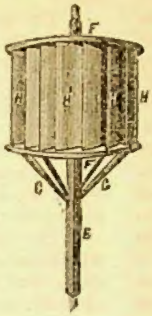
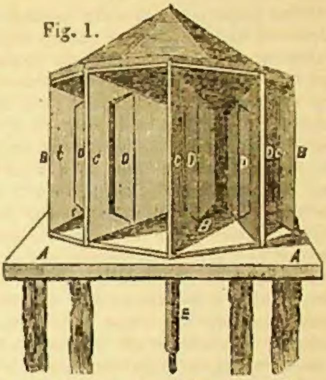


Fig. 1.



wind is gradually contracted from the point where it enters the windhouse to that at which it impinges on the vanes. DD are doors or flaps in the partitions CC, which serve to close the ends of the passages between the compartments, and prevent the wind from obtaining access to the interior of the mill when it is not required to be at work. E is the main shaft from which the motion is communicated to the grinding machinery, or other machinery to be driven. FF are circular frames or rings bolted to the arms GG, which radiate from the shaft E. HH are curved or flat vanes, or blades, which project inwards from the rings FF, by d between which they are supported. The number of these vanes may be varied, but should generally be about twice that of the ingress apertures formed by the partitions CC of the windhouse. The action of the windmill is as follows:—Three sides of the windhouse (supposing it to be, as usual, of an octagonal form) being always exposed to the prevailing winds, the wind is deflected by the partitions C C, through the passages between the said partitions to the interior of the mill, on entering which it strikes against the vanes or blades, H H, on their convex sides, and passing through between them, escapes on the opposite side, exerting during its escape, a considerable effect on the concave side of the blades HH, and thereby increasing the rapidity of the revolution of the moving parts. In order to direct a large volume of wind into the windmill, sails may be extended as continuations of the partitions CC from the windhouse in each direction. The power of the mill, or the rapidity of its revolution, will thus be considerably augmented. The proportions of the different parts of the mill may be varied indefinitely, as may also the number of partitions in the windhouse, and of vanes attached to the revolving part of the mill, which vanes may also be either straight or curved,—the latter form being, however, considered that which is best adapted for general purposes. The diameter of the revolving parts of the windmill should in no case exceed half that of the windhouse. When a windmill of this kind is employed on board ship, it will be better to dispense with the employment of the windhouse, which would only increase the cumbrousness of the apparatus without augmenting its efficiency. As the vanes on both sides of the revolving part are in operation at the same time, that is, part of the vanes being acted on by the wind on the exterior, and a corresponding number by the wind passing through the apparatus on the interior side, there will be no tendency to make the vessel incline to one side, and the equilibrium is further sustained by the centrifugal force of the blades during the revolution of the revolving part of the mill.

Claim. — The employment in windmills of a windhouse divided into partitions with doors or flaps therein, for the passage of the wind to the vanes in the manner represented in the drawings and hereinbefore described.

Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury. *For certain improvements in gas burners.* (Being a communication.) Patent dated February 23, 1852.

Claims.—1. The construction of gas burners divided into compartments, and provided with internal tubes for regulating the supply and combustion of gas.

2. The supplying of air to gas burners through orifices in the chimney, the said burners being covered with a metal cloth; and the adaptation of tubes in lieu of the ordinary apertures for the passage of the gas, by which joint arrangements the vacillation of the flame is avoided.

Thomas Walker, of Birmingham. *For*

improvements in steam engines. Patent dated February 23, 1852.

These improvements have relation to an improved construction of rotary engine, in which two cylinders, placed side by side, are employed, having cylindrical pistons revolving excentrically within them and in such relative positions on their respective shafts, that in all points of their revolution they touch constantly the ends of a slide working backwards and forwards in a recess formed in the metal between the two cylinders, which slide has suitable passages formed in it for the admission and egress of the steam into and from the cylinders, thus acting as a slide valve, and at the same time, forming the steam abutment. The slide is constructed of two wedge-shaped pieces having springs interposed, which maintain constantly a tendency to force the two parts from each other, and thus preserve steam contact between the ends of the slide and the revolving pistons, and compensate for wear. The cylinders have each one of their end covers formed in several pieces, to increase the facility of access for packing, &c., to the internal parts of the engine; and the pistons are attached to the shafts by being keyed to projections on the shafts at about the middle of their length. The motion of the two shafts is taken from them by means of wheel gearing.

Claims.—1. The mode of combining two cylindrical pistons fixed excentrically on their axes in two steam cylinders to each other, and having a slide between the two pistons.

2. The making of the slide in two parts, so that as the surfaces wear away they may be set up and be maintained constantly in contact with the two pistons.

3. The mode of constructing the slide, whereby it acts as a slide valve for admitting the steam to flow into and from the steam cylinders, and at the same time, as an abutment for the steam.

4. The mode of constructing one of the end covers of each of the steam cylinders in separate parts.

5. The mode of affixing the pistons on their axes by enlarging the axes at their middle portions.

Alfred Charles Hobbs, of New York, engineer. *For certain improvements in the construction of locks and other fastenings.* Patent dated February 23, 1852.

The improvements claimed by Mr. Hobbs are as follows:—

1. The use and application of a moveable stump to the bolt of locks, or attaching a moveable piece to the stump, or the stump to a moveable piece, for the purpose of preventing the position of the tumblers being ascertained by applying pressure to the bolt.

2. The use of a compound or double tumbler for the same purpose.

3. An arrangement, either by a circular or parallel motion, in which the bit of the key, detached from the stem, is carried into the lock, and made to operate upon the tumblers so as to bring them into a suitable position preparatory to shooting back the bolt —the key-hole being completely closed while the key-bit is operating on the tumblers.

4. A peculiar construction of lock, in which the bolt has a series of rectangular slots, and moves both vertically and horizontally, operating by a single set of slides or tumblers.

William Edward Newton, of Chancery-lane, civil engineer. *For improvements in the manufacture of coke, and in the application of the gaseous products arising therefrom to useful purposes.* (Being a communication.) Patent dated February 23, 1852.

This invention consists in obtaining ammoniacal salts from the vapours evolving from ordinary coke-ovens during the process of coke-making. The products of combustion are conducted or drawn off by a blower into a flue, in which is placed a refrigerator, and they then pass into a condenser or chamber, where they come in contact with surfaces over which trickles a stream of some solution (such as sulphuric acid and water) capable of taking up the ammonia which is subsequently obtained from the solution by concentration. The non-condensible gases pass off from the condenser, and may be allowed to escape into the air, or be applied to heating or other purposes.

Claim.—The application to coke-ovens of an apparatus by which the gaseous products evolved by the combustion of coal therein may, without interfering with the ordinary process of coking, be drawn off and conveyed to a receptacle or chamber, where they may be separated from each other and combined with other chemical agents to form valuable products, or may be applied to other useful purposes.

Jean Theodore Coupier and Marie Amedee Charles Mellier, of Maidstone, gentlemen. *For certain improvements in the manufacture of paper.* Patent dated February 23, 1852.

The *first* part of this invention consists in manufacturing pulp for paper-making from straw and other similar vegetable matters, and from the bark of the willow, osier or chesnut-tree, by the use of a boiling solution of hydrate of soda or potash, in conjunction with other chemical means, and without mechanical operations.

The patentees conduct their process as follows:—They make use of an open vessel with a perforated false bottom, on which are placed the materials to be operated on, previously cut or otherwise divided into short lengths. From the top of this vessel (which is to be closed while the operation is proceeding) a pipe leads to a second vessel capable of holding from 60 to 70 gallons, in which is placed the alkaline solution, and which is employed at a strength of from 7 degrees to 10 degrees Baumé. The end of the pipe in the first vessel is provided with a rose-head. When the process is to be commenced, steam is turned on into the alkaline solution, and its temperature raised to the boiling point. An excess of steam is then admitted, and the solution forced through the pipe and dispersed in a shower over the straw; when the solution is exhausted in this way, a fresh supply is introduced, and this operation repeated. A communication is established between the vessels by another pipe from underneath the false bottom of the first, and a circulation of the heated liquor is thereby maintained for about eight hours. Hot water is then forced through, and this washing is continued until the liquor comes off of a strength of about 1° Baumé. Cold water is then supplied to the materials, and passed through until it comes off clear. In order to bleach and disaggregate the fibres, they are then submitted to the action of a solution of hypochlorite of alumina or other hypochlorite, of a strength of about 3° Baumé, and again washed in hot water in order to remove the superfluous bleachin liquid. This reduces the mass to the condition of half stuff which is manufactured into paper according to the usual modes of operating with or without the addition of rag pulp. The quantity of alkaline solution consumed by the above process will be about thirty to forty gallons for every hundred weight of fibre, and of hypochlorite about 25 per cent. of the weight of fibre. The hydrate for the alkaline solution may be obtained by dissolving soda or potash in lime water, and decanting the clear liquor; and the hypochlorite of alumina for the bleaching process by dissolving sulphate of alumina in a solution of hypochlorite (common chloride) of lime. The waters obtained by the first process, when evaporated, yield a resinous soap, which may be mixed with other materials, and burnt as fuel, or used in the unmixed state.

The above process is applicable also to flax waste, cotton waste, hemp, tow, &c., but does not supersede the necessity of first converting these materials to half stuff.

The *second* part of the invention consists in treating wood shavings (pine, ash, elm, and beech are suitable for this purpose) with nitric acid in order to obtain therefrom a pulp to be used in the manufacture of paper.

In carrying this part of the invention into effect, the patentees employ two vessels in connection with each other, having perforated false bottoms on which the shavings to be operated on are placed in a damp state and pressed. About 80 per cent. by weight of white nitric acid (of a strength of 36° Baumé) diluted to about 5° or 6° Baumé, is then added to the shavings in one of the vessels, and after standing about four hours, heat is applied until ebullition commences, and nitrous fumes are evolved. These fumes are caused to pass into the second vessel, where they come in contact with the damped shavings, and are partially converted into hyponitric acid. When the boiling has been continued for a sufficient time, the shavings are subjected, for about two hours, to the action of solution of hydrate of potash or soda of a strength of about 2° Baumé in the manner before described, are washed, and they are then bleached by hypochlorite of alumina, using, however, only about two per cent. by weight of the materials in making the solution. This last operation, with the aid of subsequent washings, converts the shavings to a state of half stuff, which may be used alone or with rag pulp, according to the usual methods. The acid liquor employed in operating on the first batch of shavings, after having about 40 cent. of the weight of the materials added to it, is used for treating another quantity, the nitrous fumes evolved being applied as before described. By evaporating the used acid liquors, oxalic acid may be obtained, as well as an acid of a character analogous to nitropicric acid.

Claims.—1. The mode described of reducing vegetable matters into pulp by means of a solution of hydrate of soda or potash and the use of hypochlorites. Also, the mode of employing hyochlorite of alumina for bleaching vegetable matters in the process of manufacturing paper.

2. The mode of employing nitric acid in manufacturing other pulp, and obtaining other products.

CHARLES COWPER, of Southampton-buildings, Chancery-lane. *For improvements in machinery for combing and preparing wool and other fibrous substances.* (Being a communication.) Patent dated February 23, 1852.

This invention consists principally in a method of holding wool and fibrous materials while being combed, and of feeding the same to combing-machinery, by means of

two bars, straight or circular, one of which is moved along the surface of the other in a direction transversal to that in which the material is being fed in. The claims also include a peculiar construction of circular combing-machines, and the application of steam to wool while being held between bars as aforesaid.

THOMAS YOUNG HALL, of Newcastle-upon-Tyne, coal-owner and colliery viewer. *For improvements in screens for screening coal and other substances requiring to be screened.* Patent dated February 23, 1852.

These improvements consist in making the longitudinal or screening-bars of screens for screening coals and other substances to rest on pins or pivots, fixed to moveable cross bars placed at such an angle with respect to each other, and so connected, as to form a combination resembling the letter V or W, so that, by means of a screwed rod and handle, their angular position may be changed, and the spaces between the whole of the bars which are attached to the levers, or any portion of them, thereby varied or adjusted according to the size desired to be given to the meshes or interspaces. The screens can be also screwed up so that the bars will go close together, and form a dumb screen or shoot. They may also be made either fixed or portable, and in situations where power can be obtained from any prime mover, and where the necessary height or inclination of the screen is limited, the patentee prefers to give them a lateral motion, technically termed a shake, the screens being hung on links or placed on vibrating supports, by which means the coals or other substances can be screened with the screens placed at a very slight inclination.

Claim.—The means employed for varying the position of the bars (with or without independent framework), and for making the screens either fixed or portable, and forming them into a dumb screen or shoot, as before described. Also, the application of the "shake" to the same in certain cases, as described.

No English Patents Sealed this Week.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 26	3357	F. G. Yeates	Winkworth's-buildings	Box for string, &c.
28	3358	C. Carr	Stockport	Spindle, rail, and bearings, for spinning, doubling, and winding machines.
"	3359	R. Clark	Strand	Fastening for the nozzle of candle-lamps.
"	3360	W. Sanderson	Sheffield	Balance handle for knives and forks, and table steels.
30	3361	E. Harris	Ebby, near Stroud	Corrugated zinc wash slab.
31	3362	J. Dicker	Islington	Traductor.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Aug. 28	460	H. and G. Turner	Ipswich	Garment.
Sep. 1	461	P. Effertz & E. Zorn	Wellington-street, Strand	Separation hinge.
"	462	W. D. Hornsby	Bartholomew-close	Netting pattern type.
		T. A. Burrage	St. John's-square	
		I. L. Barber	Norwich	

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